DOCUMENT RESUME

ED 097 022 IR 001 208

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TITLE	Audio-Tutorial Versus Conventional Lecture-Laboratory Instruction in a University Animal Biology Course.
INSTITUTION	Auburn Univ., Ala. School of Education.
PUB DATE	14 Nov 74
NOTE	12p.; Paper presented at the Research and Technology in College and University Teaching National Conference (2nd, Atlanta, Georgia, November 1974)
EDRS PRICE	MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS	Academic Achievement; Achievement Gains; Animal Science; *Audio Video Laboratories; Audiovisual Instruction; *Biology; College Students; Conventional Instruction; *Intermode Differences; *Student Attitudes; *Student Opinion; Teaching Methods
IDENTIFIERS	Audio Tutorial Program

ABSTRACT

The purpose of this study was to analyze two methods of instruction used in an animal biology course. One group of students, the experimental group, was taught using an audio-tutorial program, and another group, the control group, was taught using the conventional lecture-laboratory method. Pretest and posttest data were collected from achievement and attitude instruments. An opinion questionnaire and time reports were also analyzed. The major findings were: (1) students taught using audio-tutorial instruction demonstrated significantly greater achievement gain but did not differ significantly in attitude toward course content; (2) an analysis of the opinion questionnaire revealed a favorable reaction by the experimental group toward the use of the audio-tutorial method of instruction; and (3) the experimental group spent a significantly greater amount of time in formal study than those students taught by the conventional approach. (Author/WH)

ED 097022

AUDIO-TUTORIAL VERSUS CONVENTIONAL LECTURE-LABORATORY INSTRUCTION IN A UNIVERSITY ANIMAL BIOLOGY COURSE

The purpose of this study was to analyze two methods of instruction used in an Animal Biology course in order to determine the outcomes of student attitude toward the course content, student reaction to the method of instruction, and the time spent by students in formal study in the classroom. One group of students, the experimental group, was taught using an audio-tutorial program, and another group, the control group, was taught using the conventional lecture-laboratory method.

Pretest and posttest data were collected from achievement and attitude instruments. These data were subjected to analysis. Data collected from the opinion questionnaire and the time reports also were analyzed.

The major findings were: (a) Students taught using audio-tutorial instruction demonstrated significantly greater achievement gain, but did not differ significantly in attitude toward course content. (b) An analysis of the opinion questionnaire revealed a favorable reaction by the experimental group toward the use of the audio-tutorial method of instruction. (c) The experimental group spent a significantly greater amount of time in formal study than those students taught by the conventional approach.

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AUDIO-TUTORIAL VERSUS CONVENTIONAL LECTURE-LABORATORY INSTRUCTION IN A UNIVERSITY ANIMAL BIOLOGY COURSE

One purpose of this study was to analyze the outcomes of two methods of instruction, conventional lecture-laboratory and audio-tutorial, as related to (a) student achievement and (b) student attitude toward the course content in a university animal biology course. A second purpose was to assess the opinions of the students enrolled in the audio-tutorial program about the audio-tutorial method of instruction. A subordinate purpose of this investigation was to determine the average amount of time spent in formal study by the students in the audio-tutorially taught course as compared to the average amount of time spent in formal study by students in the conventional lecture-laboratory instructed course.

Procedures

In order to determine the effect of a method of instruction on student achievement and student attitude it was necessary to make statistical comparisons between a control group and an experimental group. The control group was composed of 190 students enrolled in BI 103, Animal Biology at Auburn University during the Winter Quarter, 1973. These students were taught in a conventional lecture-laboratory manner by instructors who had previous experience teaching the course. The students in the experimental group were those 134 students enrolled

in BI 103, Animal Biology at Auburn University during the Winter Quarter, 1973, who received their instruction by means of the audio-tutorial program developed by Mason. The course syllabus was identical for both groups.

The following procedures were employed in comparing the two groups composing the sample:

1. Pretest instruments, to determine the achievement level of the students in their attitude toward animal biology, were administered at the beginning of the course. A student personal data sheet also was given at this time to gather certain demographic information for future use in describing the sample.

2. The treatment of the control and experimental groups was initiated. The treatment consisted of the method of instruction. The students in the control group were taught the course using conventional lecture-laboratory instruction. The students in the experimental audio-tutorial group were taught identical course content using an audio-tutorial program.

3. Posttest achievement and attitude instruments were administered at the completion of the course to all the students in the control and experimental groups. These instruments were identical in form to the pretest instruments. The experimental students at this time also were given an opinion questionnaire to assess their opinions concerning the use of the audio-tutorial method of instruction.

4. The data, including the time data, were tabulated and subjected to statistical analysis.

Population and sample

A total of 324 students participated in the study: 190 students in the control group and 134 students in the experimental group. The subjects consisted of 221 male and 103 female students enrolled in the course BI 103, Animal Biology, Winter Quarter, 1973.

The usual computer registration procedures were followed in determining the sections for which each student enrolled. The sections of BI 103, Animal Biology were listed in the Winter Quarter Schedule of Courses at 9:00 a. m., 11:00 a. m. and 1:00 p. m. The description of the course was identical for each hour scheduled so that students registering for the course had no previous knowledge as to which method of instruction would be employed in the sections.

It was decided through random procedures that the students registered for the 1:00 p. m. sections would be taught by the audio-tutorial instructional program. The first class meeting of those students was used as an orientation to the proper use of the procedures employed in the learning center or audio-tutorial laboratory. After this initial meeting of the class these students received their total instruction in BI 103, Animal Biology at the time of their own convenience in the audio-tutorial laboratory.

The two conventional lecture-laboratory sections were taught at 9:00 a. m. and 11:00 a. m. respectively. Each met for four fifty-minute lecture sessions and one three-hour laboratory session a week. This amounted to approximately seven hours of instruction per week.

Instruments

The following instruments were used in the study:

1. Achievement in Biology Test (AIBT). An achievement test was developed by the investigator with cooperation of members of the Department of Zoology-Entomology at Auburn University. Validity was established by a panel of qualified experts who reviewed the instrument and found the test items to be a representative sample of the content that the instrument was designed to measure. The professors involved in the study had no knowledge of the contents of the test. They did not participate in its construction or in the validation process. The AIBT was composed of sixty five-stemmed multiple-choice test items. Forty-eight items tested material covered during the lecture portion of the course. The other twelve items tested material covered during the laboratory sessions. The achievement instrument was pilot tested to establish its reliability on students enrolled in BI 103, Animal Biology during the Fall Quarter of 1972. The split-half method to calculate the reliability coefficient and the Spearman-Brown formula to correct the coefficient established the reliability coefficient of the AIBT as .86. Scoring of the AIBT was accomplished by assigning one point to each item having a correct response. Thus, a student score from zero to sixty was possible on the AIBT. In the final analysis, the correct number of responses for each student was used to analyze the groups statistically.

2. A Scale to Measure Attitude Toward Any School Subject: Form A (Master Attitude Scale).

This scale, edited by H. H. Remmers, was selected to determine students' attitude toward the course, animal biology. Shaw and Wright reported a

reliability coefficient of .81 when this scale was used in biology. The scale also was reported to have adequate content validity. Each of the seventeen statements was given a scale value. Item number one was given the scale value of 10.3, while item number seventeen had the scale value of one. Item number nine had the scale value of six which was the neutral point on the scale. The median scale value of the statements endorsed by the student was the attitude score.

3. Opinion Questionnaire.

This instrument was developed by the investigator and was used to assess the experimental group students' opinions of the audio-tutorial method of instruction. The instrument consisted of sixteen statements. A Likert-type scale was used which forced a decision favoring or disfavoring each statement. Only four choices were available: SA-Strongly agree, A-Agree, D-Disgree, SD-Strongly disagree. The data that was collected from the opinion questionnnaire was analyzed to determine the number and percentage of students that responded to each of the four choices of the sixteen statements.

4. Data concerning the average amount of time spent in formal study by students in the audio-tutorial group were gathered by a time card which was kept by each student. Data concerning the average amount of time spent in formal study by students in the control group was kept by checking the roll each day during the lecture and laboratory sessions. Each student was allocated fifty minutes for each lecture session attended and 170 minutes for each laboratory session attended.

Findings

Hypotheses tested

For the purpose of this study two null hypotheses were presented. The findings as they related to the study's hypotheses were as follows:

Ho_1 There will be no significant difference, at the .01 level, in the achievement level attained by: (a) group receiving instruction in animal biology using the conventional lecture-laboratory method; and (b) the group receiving instruction in animal biology using the audio-tutorial method as measured by the AIBT.

This null hypothesis was not accepted. The students taught by the audio-tutorial method of instruction made a significantly higher mean score on the AIBT than the students taught by the conventional lecture-laboratory method. (See Table 1.)

TABLE 1

THE t TEST ANALYSIS OF THE AIBT FOR THE EXPERIMENTAL AND CONTROL GROUPS

Group	Test	n	Mean	SD	t
Experimental (A-T)	Pretest	134	23.13	6.1	
Control (Conventional)	Pretest	190	23.11	5.5	.03 ns
Experimental (A-T)	Posttest	134	45.21	8.2	
Control (Conventional)	Posttest	190	40.42	7.4	5.54*

*Significance ($p<.01$)

Ho_2 There will be no significant difference, at the .01 level, in attitude toward the subject shown by: (a) the group which receives instruction in animal biology using the conventional lecture-laboratory method; and (b) the group which receives instruction in animal biology using the audio-tutorial method as measured by the Master Attitude Scale.

This null hypothesis was accepted. The analysis made using the t test indicated that there was no significant difference between the mean score made on the attitude scale by students taught by the audio-tutorial method and students taught by the conventional lecture-laboratory method. (see Table 2)

TABLE 2

THE t TEST ANALYSIS OF THE MASTER ATTITUDE SCALE FOR THE EXPERIMENTAL AND CONTROL GROUPS

Group	Test	n	Mean	SD	t
Experimental (A-T)	Pretest	134	8.12	.78	
Control (Conventional)	Pretest	190	8.17	.90	.55 ns
Experimental (A-T)	Posttest	134	8.18	.97	
Control (Conventional)	Posttest	190	8.21	1.07	.25 ns

*Significance ($p < .01$)

Analysis of the opinion questionnaire

The 134 students comprising the experimental group in this investigation were administered an opinion questionnaire at the completion of the audio-tutorial program to determine their reactions toward various aspects of the audio-tutorial method of instruction.

The following findings were made with regard to the experimental group students' responses to the questionnaire:

1. Seventy-six per cent agreed to preferring the audio-tutorial method used in the course to the more conventional lecture-laboratory method of instruction.

2. Fourteen per cent agreed that there should have been more conventional laboratory work.

3. Ninety-three per cent agreed that the laboratory assistants were always willing to help students with difficulties that arose in the audio-tutorial laboratory.

4. Twenty-four per cent agreed that the professor in charge of the class should have made himself more accessible to the students.

5. Forty-two per cent agreed that the audio-tutorial laboratory was physically uncomfortable.

6. Seven per cent agreed that music should be used as a background in the audio tapes.

7. Ninety-five per cent agreed that the "Sound-on-Slide" presentations in the course helped in understanding the course content.

8. Two per cent agreed that the study guide was unnecessary and a waste of time.

9. Sixty per cent agreed that the group discussion meetings were beneficial.

10. Thirteen per cent agreed that attendance should have been required at the group discussion meetings.

11. Four per cent agreed that the laboratory experiences (dissection, experimentation, etc.) were not useful.

12. Thirty per cent agreed that a conventional lecture-laboratory course which covered the same content would have been better.

13. Ten per cent agreed that the brief, oral quizzes at the conclusion of each laboratory experience were not helpful.

14. Fifty-five per cent agreed that it was easy to arrange time to go to the audio-tutorial laboratory.

15. Thirty per cent agreed that audio-tutorial instruction represented too much work for the amount of knowledge acquired.

16. Seventy-five per cent agreed that they would recommend the audio-tutorial course to their friends.

Analysis of the amount of time spent in formal study

A subordinate purpose of the study was to determine the average amount of time spent in formal study by the students in the audio-tutorially taught course as compared to the average amount of time spent in formal study by students in the conventional lecture-laboratory instructed course. The following findings was made regarding the amount of time spent in formal study: the mean time spent by students in the group taught audio-tutorially for the Winter Quarter was 67.12 hours. The standard deviation for the group was 18.14. The students in the conventional lecture-laboratory instructed course spend a mean or average time of 50.72 hours in formal study during the Winter Quarter. The standard deviation for this group was 5.04. The large standard deviation of the experimental group indicated a wide range of time spent in formal study as the result of the structure of the self-paced audio-tutorial program.

Conclusion

On the basis of the findings in this study, the following conclusion was drawn: Since the statistical analysis data indicated that the use of the audio-tutorial program was (a) more effective on student achievement gain than the conventional method of instruction, and (b) as effective as related to student attitude toward the course content as the conventional method, continued use of the audio-tutorial program is justifiable.

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